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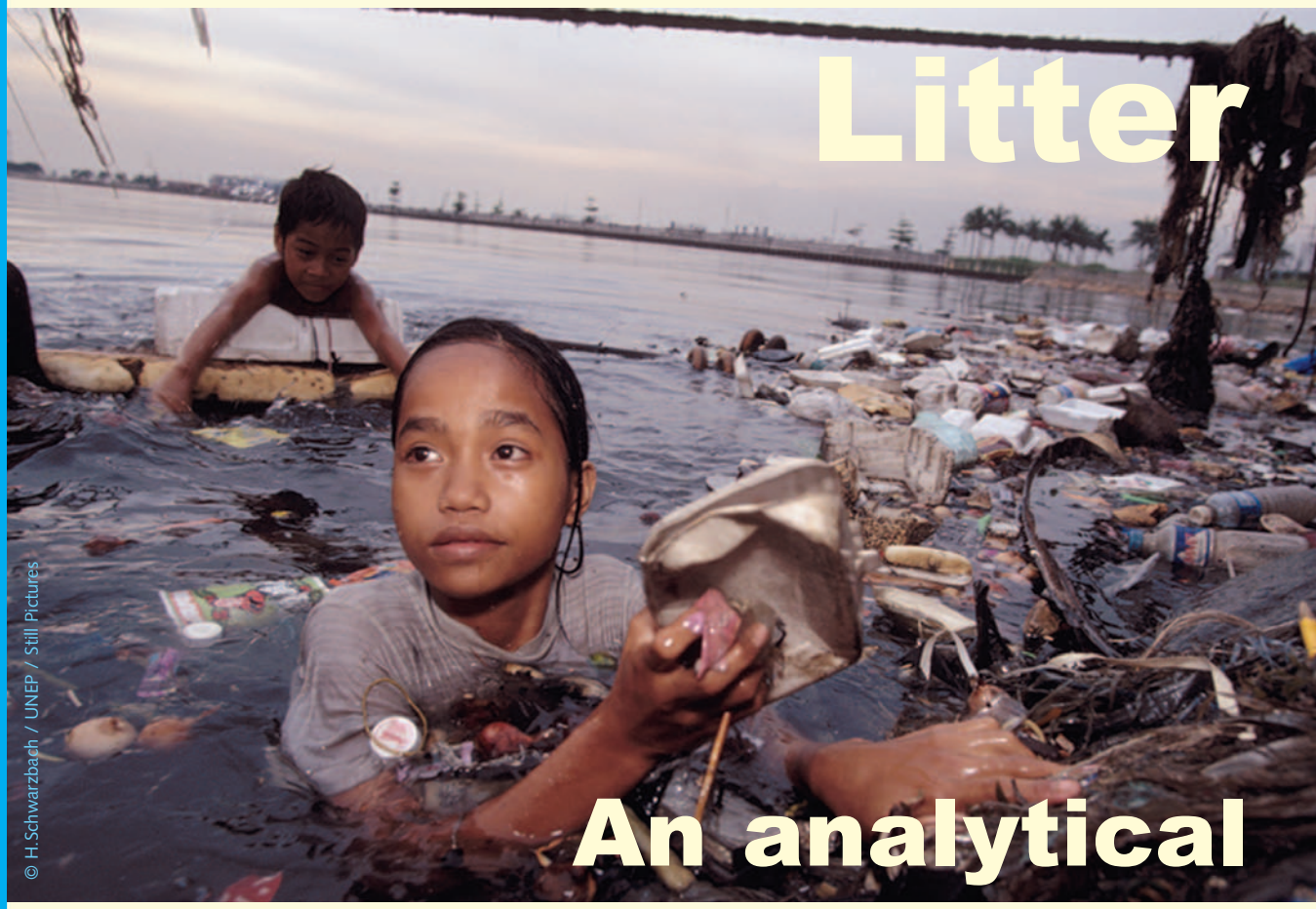
Marine Litter



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An analytical overview

This overview was prepared by the Regional Seas Coordinating Office, the Secretariat of the Mediterranean Action Plan (MAP), the Secretariat of the Basel Convention, and the Coordination Office of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) of the United Nations Environment Programme (UNEP), in cooperation with the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC of UNESCO).

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Marine Litter

An analytical overview

UNEP 2005

FOREWORD

Marine litter poses a vast and growing threat to the marine and coastal environment.

It is found in all sea and ocean areas of the world – not only in densely populated regions but also in remote places far away from any obvious source. Marine litter travels over long distances with ocean currents and winds and is found everywhere in the marine and coastal environment, from the poles to the equator, from continental coastlines to small remote islands. Marine litter originates from many sources and causes a wide spectrum of environmental, economic, safety, health and cultural impacts. The very slow rate of degradation of most marine litter items, mainly plastics, together with the continuously growing quantity of the litter and debris disposed, is leading to a gradual increase in marine litter found at sea and on the shores.

It is estimated that about 6.4 million tons of marine litter are disposed in the oceans and seas each year. According to other estimates and calculations, some 8 million items of marine litter are dumped in oceans and seas every day, approximately 5 million of which (solid waste) are thrown overboard or lost from ships. Furthermore, it has been estimated that over 13,000 pieces of plastic litter are floating on every square kilometre of ocean today.

Despite efforts made regionally, nationally and internationally, there are indications that the marine litter problem keeps growing. As long as the input of non-degradable or slowly degradable litter into the marine environment keeps increasing, their destructive impact on the ocean and coastal environment will increase likewise. Deficiencies in the implementation and enforcement of existing international, regional, national regulations and standards that could improve the situation, combined with a lack of awareness among main stakeholders and the general public, are other major reasons why the marine litter problem not only remains but keeps increasing worldwide.

Marine litter is part of the broader problem of waste management. Solid waste management is becoming a major public health and environmental concern in many countries, where generally a lack of appropriate systems for the management of waste, from its source to its final disposal or processing, exists.

However, proper waste management is increasingly being recognized by the international community as an important issue to be addressed worldwide. It was identified as one of the nine source categories of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, GPA, 1995, and recognized as a priority issue in a decision of UNEP's Governing Council/Global Ministerial Environment meeting in Jeju, Republic of Korea, in March 2004. The issue of marine litter and the destructive effects of abandoned fishing gear were further emphasized in resolution 59/25 of the UN General Assembly on 17 November 2004 on Oceans and the Law of the Sea – Sustainable Fisheries". Furthermore, decision 59/22 of 10 November 2004 on Oceans and the Law of the sea recommends that marine debris should be included in the discussions of the United Nations Consultative Process on the Law of the Sea (UNICPOLOS) as well as in the 2004 Secretary General's Report.

Many organisations, including UN organisations, and other programmes have now dedicated themselves to fight marine litter in its various aspects. A wide range of marine litter-related activities have already been developed, mainly on regional or national scales. But the solutions are not keeping up with the problems, and a broader approach aiming at creating inter-agency partnerships to deal with the problem has yet to be explored and developed. UNEP could play a growing role in addressing this problem.

Considering the magnitude and the severity of the marine litter problem, UNEP's Regional Seas Programme, in cooperation with the GPA, initiated a "Feasibility Study on Sustainable Management of Marine Litter" to assess the global threat posed by marine litter worldwide and to examine the efficacy of current instruments, programmes and initiatives.

This study, summarized in the analytical review before you, proposes a series of global and regional activities aimed at controlling, reducing and abating the problem.

The UNEP Regional Seas Programme and the GPA, stand ready to play a facilitating role forwarding international action on marine litter through such activities as developing interagency partnerships, engaging stakeholders and setting the stage for enhanced action by all stakeholders.

Veerle Vandeweerd
UNEP Regional Seas Programme
Coordinator, UNEP Global Programme of Action

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This overview was initiated by the UNEP Regional Seas Programme in collaboration with the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP/GPA), and is the result of cooperation among a number of organizations and individual experts.

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The problem

Marine litter currently poses a dire, vast and growing threat to the marine and coastal environment. Any persistent, manufactured or processed solid material disposed of or abandoned in the marine and coastal environment can be defined as marine litter. Most marine litter consists of material that degrades slowly, if at all, so a continuous input of large quantities of these items results in a gradual build-up in the marine and coastal environment. This negative trend has been confirmed by a number of studies in various regions, clearly indicating that the situation with regard to marine litter is continuously getting worse.

Deficiencies in the implementation and enforcement of existing international and regional environment-related agreements, as well as national regulations and standards, are contributing to the problem. Littering practices from the shipping sector, as well as lack of land-based infrastructure to receive litter, combined with a lack of awareness among main stakeholders and the general public, are other major reasons that the marine litter problem appears to increase worldwide.

Marine litter is an environmental, economic, health and aesthetic problem. It causes damage and death to wildlife. It threatens marine and coastal biological diversity in productive coastal areas. Pieces of litter can transport invasive species between seas. Medical and sanitary waste constitutes a health hazard and can seriously injure people. Every year, the presence of marine litter causes damage that entails great economic costs and losses to people, property and livelihood, as well as poses risks to health and even lives. And marine litter spoils, fouls and destroys the beauty of the sea and the coastal zone.

A wide range of marine litter-related instruments already exist and actions are being taken at the global and regional levels. Nationally, a number of countries have taken comprehensive action to address the marine litter issues through legislation, enforcement of international agreements, providing reception facilities for ship-generated wastes, improving their waste management practices and supporting extensive beach-clean up activities, as well as information, education and public awareness programmes. Thus, much is already being done, but as the threat grows rather than diminishes it is clear that much more remains to be done.

The overview

The overall objective of the present overview has been to assess the threat posed by marine litter worldwide and examine the efficacy of current instruments, programmes and initiatives that address this global threat.

In the development of this study, consultations were held with many UN bodies and other intergovernmental organizations as well as NGOs that have expertise in issues related to marine litter and that were generous enough to share their thoughts and experience with UNEP. These include the Intergovernmental Oceanographic Commission (IOC) of UNESCO; the Secretariat of the Basel Convention; UNEP's Division of Technology, Industry and Economics (UNEP-DTIE); the Food and Agriculture Organisation (FAO) Fisheries Department; the International Maritime Organisation (IMO; Marine Environment Department and the Secretariat for the London Convention); the Mediterranean Coordinating Unit of the UNEP Regional Seas Programme for the Mediterranean; and the NGO Hellenic Marine Environment Protection Association (HELMEPA)

1. MARINE LITTER: WHAT, WHERE AND HOW?

1.1 Definitions

Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; accidentally lost, including material lost at sea in bad weather (fishing gear, cargo); or deliberately left by people on beaches and shores.

1.2 Global distribution of marine litter

Marine litter may be found near the source of input but could also be transported over long distances with ocean currents and winds. As a result, marine litter is found in all sea areas of the world – not only in densely populated regions but also in remote places far away from any obvious sources (*e.g.*, on islands in the middle of oceans, and in the polar regions). Marine litter can blow around; remain floating on the water surface; drift in the water column; get entangled on shallow, tidal bottoms; or sink to the seabed at various depths. It is found in oceans and seas, in salt marshes and estuaries, in mangroves, on coral reefs, and on all kinds of shores.

1.3 Quantities of marine litter

Despite actions taken nationally and internationally, the situation with regard to marine litter is continuously getting worse.

Globally
There are no recent and certain figures on the amounts of marine litter worldwide. Nor are there any such global figures on the annual input of marine litter to the marine and coastal environment. In 1997, the US Academy of Sciences estimated the total input of marine litter into the oceans, worldwide, at approximately 6.4 million tonnes per year. According to other calculations, some 8 million items of marine litter have been estimated to enter oceans and seas every day, about 5 million of which are thrown overboard or lost from ships. Furthermore, it has been estimated that over 13,000 pieces of plastic litter are floating on every square kilometre of ocean surface.

In the 2002 International Coastal Cleanup, organized by the Ocean Conservancy (a US NGO), over 390,000 volunteers in 100 countries took part. They removed marine litter from more than 21,000 kilometres of coastline and waterways collecting more than 6.2 million pieces of marine litter, weighing over 4,000 tonnes. Almost 58 per cent of the marine litter found could be attributed to shoreline and recreational activities, such as beach-picnicking and general littering. Many other such cleanup operations are carried out every year by thousands of school children, volunteers and local authorities in a large number of countries in all parts of the world.

Regionally:
In contrast, various regional figures on quantities and distribution of marine litter are available.

In a 1998 survey, 89 per cent of the litter observed floating on ocean surface in the North Pacific was plastic. The Algalita Marine Research Foundation (AMRF) has conducted surveys to compare the quantities of plastic fragments floating on the ocean surface to the availability of food with which they are mixed. In the central Pacific gyre, the AMRF in 2002 found 6 kilos of plastic for every kilo of plankton near the surface.

About 3,500 plastic resin pellets per km^2 have been reported floating on the surface in the Sargasso Sea. Near industrial centres in New Zealand, concentrations of up to 100,000 pellets were observed in one km^2 of beach. In 1990, American scientists reported a 200–400 per cent increase from 1972 to 1987 in the number of pellets present in the North Atlantic Ocean.

During one decade (1992–2002), over 73,000 m^3 of marine litter have been gathered on some 300 kilometres of rocky beach on the Swedish west coasts (including thousands of islands, islets and skerries), which is the easternmost part of the North Sea. The average annual amount of litter cleaned up on those beaches is 6,000–8,000 m^3.

According to figures from the North Sea, as well as from the water around Australia, it has been estimated that up to 70 per cent of the marine litter that enters the sea ends up on the seabed, whereas half of the remaining amount is found on beaches and half floating on the water surface.

In 2002, the United States National Oceanic and Atmospheric Administration (NOAA) collected 107 tonnes of nets and lines and other fishing gear on the Pearl and Hermes Atoll (northern Hawaiian Islands) alone. In 2003, another 90 tonnes were found near the Pearl and Hermes, and Midway Islands. Heavy fishing gear litters the beaches, but probably much more serious is the fact that the gear gets snagged in the coral reefs, tearing the corals apart. It also traps endangered monk seals and threatens green sea turtles.

There are strong indications from many regions, *e.g.*, the North Sea, that the quantities of marine litter are increasing. Consequently, the resulting environmental and socio-economic problems are worsening.

Despite international and national efforts made during the last two decades, there are no clear indications that the quantities and distribution of marine litter are decreasing, either globally or regionally.

1.4 Sources of marine litter

Because marine litter comes from sea-based sources and land-based sources, measures to reduce or prevent it must be taken in a large number of places, within a large number of activities in a wide range of societal sectors, and by many people in many situations. Marine litter could, for example, be waste from landfills (waste dumps) on land. It could be galley waste and cargo room waste from commercial shipping. It could be domestic waste, including waste from beachgoers. It could be nets and fish boxes from fishing vessels. It could be waste from industrial production or distribution. It could be medical waste, and sewage-related waste from bathrooms. However, the main sources can be grouped as follows:

Main sea-based sources of marine litter:	**Main land-based sources of marine litter:**
• Merchant shipping, ferries and cruise liners; • Fishing vessels; • Military fleets and research vessels; • Pleasure craft; • Offshore oil and gas platforms; and • Aquaculture installations.	• Municipal landfills (waste dumps) located on the coast; • Riverine transport of waste from landfills, *etc*., along rivers and other inland waterways; • Discharges of untreated municipal sewage and storm water (including occasional overflows); • Industrial facilities (solid waste from landfills, and untreated waste water); and • Tourism (recreational visitors to the coast).

1.5 Effects of marine litter

Marine litter kills, injures and causes pain and suffering and every year entails great economic costs and losses to people and communities around the world.

Entanglement and ingestion are the primary kinds of direct *damage to wildlife* caused by marine litter. Other threats to wildlife and the environment from marine litter include smothering of the seabed, and disturbance of habitats from mechanical beach cleaning. Marine litter is also increasingly believed to be a source of accumulation of toxic substances in the marine environment, and environmental changes due to the transfer and introduction of invasive species.

A team of expert marine biologists and chemists has carried out research that proves for the first time that oceans and shores are contaminated with microscopic fragments and fibres of plastic, which are degradation/disintegration products of larger plastic marine litter items. The results

show conclusively that microscopic plastics are now common in marine and coastal habitats. These fragments and fibres were found in beach and bottom sediments and in the water column. In the study it was also demonstrated that marine organisms, such as barnacles and lugworms, eat the microscopic pieces of plastic. Given the durability of plastics and the disposable nature of many plastic items, this type of contamination is likely to increase.

Damage to people, property and livelihood caused by marine litter can be grouped into a number of general categories. These include damage to fishing, fishing boats and gear; damage to cooling water intakes in power stations; contamination of beaches (demanding cleaning operations); contamination of commercial harbours and marinas (demanding cleaning operations); and contamination of coastal grazing land, causing injury to livestock. Marine litter-related damage to people also includes safety risks at sea (demanding rescue services) due to fouling of propellers, *etc*., as well as damage to people's health (injuries, disease) from litter on beaches and in bathing water, including medical waste.

2. MEASURES TO PREVENT AND COMBAT MARINE LITTER

Measures to prevent and combat marine litter have to be taken in a large number of places, within a large number of activities and by many people in many situations. Considering the wide range of sources of marine litter, measures to address the problem, be it at the global, regional or national level, have to be equally comprehensive in their approach.

One needs to differentiate between measures aimed at preventing marine litter at source and measures taken to deal with marine litter once it is being found in the marine and coastal environment. Preventive measures include, *inter alia,* better waste management on land and at sea, and education and awareness-raising activities to influence behaviours. Measures to deal with existing marine litter include beach and sea-bottom clean up operations, projects to allow fishing vessels to leave marine litter caught in fishing gear ashore without having to pay any garbage fee, etc.

Political and legal initiatives

As noted previously, marine litter is an issue that is connected to other marine environmental, economic and health problems, including the possible distribution of toxic substances, the destruction of marine habitats and biodiversity, and the transfer of invasive species.

Marine litter is not always specifically mentioned in global or regional conventions, agreements or action plans. However, when such documents include, *e.g.*, measures to decrease or eliminate the discharge of ship-generated waste, measures to stop the discharge of solid waste from land-based sources, or measures to protect rivers from pollution, or action taken to reduce the loss of fishing gear from fishing vessels, the issue of marine litter is implicitly covered. Similarly, when political agreements address the need to protect coastal habitats, the need to sustain the health and productivity of seas and coastal areas, and the need for integrated coastal zone management and sustainable development of seas and coastal zones, the issue of marine litter is included.

Prevention and waste-wisdom in general

Measures to reduce or prevent marine litter are part of waste management in society as a whole. Good waste management must begin with preventing waste from being generated – what is never produced does not have to be disposed of and cannot become marine litter. The second step is to collect waste that has already been generated and make sure it is being taken care of properly, either for reuse and recycling of materials and products (to as large an extent as possible) or for disposal in a manner that is as safe as possible from an environmental and health point of view.

Research and development projects are carried out with the objective to develop plastic packaging material that can be degraded (*e.g.,* by bacteria, or under the influence of UV light). However, although such materials might help decrease the total amount of persistent plastics in the marine and coastal (and terrestrial) environment, one should be aware of the fact that developing more "litter-friendly" materials will send the wrong signal to people. It will be quite contradictory to the many attempts made to change behaviours. If contaminating the environment with "litter-friendly" waste is considered acceptable, it will be very difficult to draw the line and accomplish any consistent change in attitude and behaviour.

Sea-based sources

To prevent marine litter from merchant ships, offshore platforms and pleasure craft, efforts should be made to reduce the generation of waste onboard ships and platforms. Waste management plans are needed for larger vessels and platforms, and preparations for proper waste management should be made in advance also by those onboard smaller vessels and pleasure craft. Waste should be stored onboard and discharged ashore in a proper reception facility. However, this requires adequate space onboard for storage, and the provision of reception facilities in all commercial harbours and marinas. It also calls for harmonized regional and global regulations to ensure that harbours/marinas are equipped to take care of the waste and that they do not cause ships undue delay in port. Also, ships should not be deterred from discharging waste to port reception facilities due to high costs, complicated procedures, unnecessary paperwork, excessive sanitary regulations, customs regulations, *etc*. Furthermore, coastal municipalities must make sure that the waste left in reception facilities is properly taken care of on land, in a manner that is optimal in terms of caring for the environment and human health – the management chain must not be broken.

Regarding marine litter from fishing vessels, efforts should be made to reduce the generation of waste onboard, and preparations should be made for storage of waste onboard until one comes ashore. All fishing gear, particularly drift nets, should be marked to make it possible to find them again if they are lost at sea. No fishing gear should ever be deliberately discarded but taken ashore for proper disposal.

Land-based sources

Efforts to enhance land-based waste management need to be promoted. Such efforts include, for example, the proper management by municipalities of landfills and sewage treatment facilities.

In the case of municipal landfills and sewage treatment, coastal and riverside communities/municipalities should make sure that open landfills for household waste and/or industrial waste are eliminated, as part of their overall waste management strategy. Sewage treatment, in adequately equipped facilities, should be a priority for municipalities. Solid household waste should be sorted and taken proper care of.

All beaches and camping grounds should be sufficiently equipped with waste bins to cater for the needs of visitors (beach-goers, campers, *etc*.) using these locations. However, people should preferably always take home their own trash and make sure that it is properly sorted and disposed of for maximum recycling.

Education and information

Education, information and training are vital components in all efforts towards more waste-wise thinking in society as a whole. Education and training are needed for ship owners, ship operators, crews, port users, fishers, users of pleasure craft and the general public to raise the awareness of everyone's responsibility to prevent marine pollution. Education on the sources and effects of marine litter and ways of reducing the problem at source needs to be incorporated into the curricula on different levels in the educational sector.

Cleanup operations and campaigns

Regular cleanup operations are carried out in many countries throughout the world. In most cases, the work is done by local authorities, volunteers or NGOs. The costs for such cleanups can be significant. In 1998, 64 local communities in the North Sea region reported that they had to spend about USD 6 million annually on cleaning their beaches in order to maintain their recreational (aesthetic) values and keep them safe for beachgoers. Costs to fishers can also by substantial. It has been estimated that each fishing vessel in the Shetland Islands could lose between USD 12,000 and 60,000 each year due to marine litter impact.

The International Coastal Clean-up reports results from clean-up campaigns in 100 countries. In addition to beach cleanups, campaigns and projects to clean up bottom areas, *e.g.,* coral reefs and other valuable marine areas, are carried out by diver associations and authorities.

In some regions, authorities are running projects to encourage fishes to deliver marine litter caught in fishing gear to reception facilities in port instead of throwing it overboard back into the sea. Since the fishers do not have to pay any fees for this activity to the ports, there are no economic disincentives involved.

The clean-up campaigns carried out worldwide do not only serve the purpose of removing litter from beaches and sea bottoms, but also as major educational and information campaigns to reach people and make them feel that they can be part of the solution and not part of the problem.

2.1 Global action, actors and initiatives on marine litter

2.1.1 Conventions and agreements

International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)

The MARPOL 73/78 Convention is the main international convention aimed at controlling pollution from the shipping sector. The Convention has six annexes, each one dealing with a specific type of potential pollutant from ships:

- Annex I, covering oil and oily wastes, has been in force since 1983;
- Annex II, covering noxious substances in bulk, has been in force since 1987;
- Annex III, covering harmful substances in packaged form, has been in force since 1992;
- Annex IV, covering sewage, has been in force since 2003;
- Annex V, covering garbage (that may become marine litter), has been in force since 1988; and
- Annex VI, covering air pollution from ships, will enter into force in May 2005.

The MARPOL Convention regulates types and quantities of waste that ships may discharge into the sea, taking into account the ecological sensitivity of different sea areas. The disposal of plastics is generally prohibited.

Annex V (an optional annex) has been ratified by 116 countries, the merchant fleet tonnage of which represents 95.1 per cent of the world's total. It has been in effect since 1988. This Annex deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of. The requirements are much stricter in a number of "special areas." Another very important regulation set out in Annex V is the complete ban on the dumping of all types of plastic into the sea.

Annex V covers, in principle, all kinds of vessels, including fishing vessels and leisure crafts. Concerning larger commercial vessels the information gathered indicates that the MARPOL Annex V regulations (*e.g.,* garbage record books, placards, *etc.*) are implemented to a great extent onboard the ships and that there is a reasonably good awareness about the regulations among the crews. It is the availability of appropriate reception facilities in ports that is regarded as the main bottleneck for effective implementation. In many places the capacity to manage/treat the waste that has been delivered ashore is also lacking.

Annex V requires that all ships of 400 gross tons and above, or ships certified to carry more than 15 persons, develop and follow a written garbage management plan. Such plans should have been developed by 1 July 1997 (1 July 1998 for existing ships) and include the following:

- Description of the collection, processing, storage and disposal of each type of waste generated by the ship (as listed in Annex V of MARPOL 73/78), and waste that may be further categorized by local requirements, *e.g.*, hazardous and medical waste;
- A list of waste management techniques/equipment available and to be employed by the ship;
- Provisions for the discharge of garbage in compliance with Annex V; and
- Designation of a person to be responsible for carrying out the plan.

The North Sea and adjacent areas, the Baltic Sea, the Mediterranean Sea, the Black Sea, the Wider Caribbean, the Red Sea, the Gulf Area, and Antarctica have been designated as Special Areas with regard to Annex V. In accordance with the regulations for Special Areas, discharges of garbage (except food waste) into the sea are prohibited. The Convention also include an obligation that countries surrounding sea areas that have been designated as Special Areas should provide appropriate reception facilities for ship-generated waste in their ports and harbours. The garbage discharge requirements for a region that has been designated as a Special Area will not enter into force until adequate reception facilities for Annex V type wastes are provided (regulation 5(4)(b) of Annex V).

IMO has adopted Guidelines for the implementation of MARPOL 73/78 and has also worked extensively on the issue of port reception facilities (on the regulatory level, as well as with regard to technical co-operation activities). In addition, a number of recommendations, *e.g.,* on the need for waste management plans, have been adopted under MARPOL Annex V.

Convention for the Prevention of Marine Pollution from Dumping of Wastes

The London Convention (LC) was signed in 1972 and covers solely the control of dumping of wastes at sea. Annex I of the Convention lists wastes and other matters which must not be dumped. It is recognized that plastic materials, and other materials that may cause problems of entanglement and ingestion by marine organisms, constitute an environmental hazard. As a consequence, the dumping of such materials is prohibited. The Convention is applicable to wastes from land-based sources that are loaded onto ships for the deliberate purpose of dumping them at sea and to dredged spoils. It should be emphasized that the Convention does not address wastes that have been generated during the normal operation of ships.

Basel Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal

The Basel Convention addresses the problems and challenges posed by the transboundary movements, and the environmentally sound management of hazardous wastes and other wastes.

Any hazardous (in the sense of the Convention) marine litter from land-based sources would fall under the scope of the Convention. Some non-hazardous land-based marine litter would also fall under the scope of the Basel Convention under the categories of wastes requiring special consideration (*i.e*. wastes collected from households). However, solid plastic waste, for instance, would not generally be considered as a "Basel" waste unless it exhibits any hazardous characteristics as identified in the convention (Annex III) and is listed under Annex IX, List B of the Convention.

In this context, a number of Technical Guidelines for the Environmentally Sound Management of hazardous and other wastes, adopted by the Parties to the Basel Convention, would be relevant to the marine litter problem, such as:

- The Technical Guidelines on Wastes Collected from Households;
- The Technical Guidelines on Specially Engineered Landfill (D5); and
- The Technical Guidelines for the Identification and Environmentally Sound Management of Plastic Waste and for Their Disposal.

The 1999 Basel Declaration on Environmentally Sound Management presents a vision for the current decade that environmentally sound management should become accessible to all Parties to the Basel Convention. In this context, the Basel Declaration enhances the prevention, minimization, recycling, recovery and disposal of hazardous and other wastes. This should be

done taking into account social, technological and economic concerns; the active promotion and use of cleaner technologies and production methods; the further reduction of the movement of hazardous and other wastes; the prevention and monitoring of illegal traffic; the improvement of institutional and technical capabilities – through technology when appropriate – especially for developing countries and countries with economies in transition; and the further development of regional and sub-regional centres for training and technology transfer.

The Strategic Plan for the Implementation of the Basel Convention for the next decade, adopted at the Sixth meeting of the Conference of the Parties (2002), aims at implementing the vision set forth in the Basel Declaration on Environmentally Sound Management, and provides for the undertaking of specific projects and programmatic activities whether at the national or the regional levels.

Agenda 21 and the Johannesburg Plan of Implementation

Agenda 21 is the comprehensive plan for global, national and local action by organizations of the United Nations system, governments, and major groups in every area in which human activity impacts the environment. It was adopted at the UN Conference on Environment and Development (UNCED), held in 1992. Chapter 17 of Agenda 21 deals with the protection of the oceans, all kinds of seas (including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources). Chapter 18 deals with freshwater (including the management of rivers and lakes). Chapter 21 deals with solid waste ("all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris. Environmentally sound waste management is concerned not just with safe disposal or recovery but also with the root cause of the problem, such as unsustainable production and consumption patterns").

Issues related to the protection of the marine environment are included in the Johannesburg Plan of Implementation adopted by the World Summit on Sustainable Development (WSSD), held in 2002. Paragraph 22 deals with prevention and minimization of waste and maximization of reuse, recycling and use of environmentally friendly alternative materials, in order to minimize adverse effects on the environment and improve resource efficiency. Paragraph 32 deals with land-based sources emphasizing the importance of the implementation of the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. Paragraph 33 deals with marine pollution from shipping, stating that relevant international conventions should be ratified and implemented.

Convention on Biological Diversity, with the Jakarta Mandate

The Jakarta Mandate on Marine and Coastal Biodiversity is part of the UN Convention on Biological Diversity (CBD). The Jakarta Mandate is a global consensus on the importance of marine and coastal biological diversity and part of the work to implement the CBD. The work programme is focused on five key elements: Marine and coastal biodiversity resource management; Sustainable use of marine and coastal biodiversity; Marine and coastal protected areas; Mariculture; and Alien/Invasive species. The issue of marine litter is relevant for the thematic areas of marine and coastal biodiversity (smothering of the seabed, and the effects of entanglement and ingestion of litter on fish, marine mammals and seabirds), and alien species (litter as a vector for transport of species).

Convention on Migratory Species, with the Agreement on the Conservation of Albatrosses and Petrels

In the Agreement on the Conservation of Albatrosses and Petrels, an Agreement to the global Convention on Migratory Species, the problem of marine debris is specifically referred to under Management of human activities (Pollutants and marine debris). Accordingly, the Parties shall take appropriate measures, within environmental conventions and by other means, to minimise the discharge from land-based sources and from vessels, of pollutants, which may have an adverse effect on albatrosses and petrels either on land or at sea.

Global Programme of Action for the Protection of the Marine Environment from Land-based Activities

Major threats to the health, productivity and biodiversity of the marine environment result from human activities on land – in coastal areas and further inland. A large proportion of the pollution load in the oceans originates from land-based activities, including municipal, industrial and agricultural wastes and run-off, as well as atmospheric deposition. These contaminants affect the most productive areas of the marine environment, including estuaries and near shore coastal waters. The marine environment is also threatened by physical alterations of the coastal zone, including destruction of habitats of vital importance to maintain ecosystem health. In response to these major problems, 108 governments and the European Commission committed themselves in 1995 to protect and preserve the marine environment from the negative environmental impacts of land-based activities by adopting the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP/GPA).

The aims of the UNEP/GPA include the identification and assessment of the sources of marine degradation, including coastal and upstream point sources and coastal and upstream non-point (diffuse) sources, and the affected or vulnerable areas of concern such as critical habitats, habitats of endangered species, ecosystem components, shorelines, coastal watersheds, estuaries, specially protected marine and coastal areas, and small islands.

The GPA is an action-oriented programme with the goal of addressing the negative effects of land-based activities on the marine and coastal environment. Such activities can, *inter alia,* cause or exacerbate poor human health, poverty, economic losses and food insecurity. The GPA assists states, individually and/or jointly, in taking concrete action that generates tangible results with respect to policies, priorities and resources. The implementation of the GPA is primarily the responsibility of governments, in close partnerships with all stakeholders, including local communities, public organizations, non-governmental organizations and the private sector.

Since its adoption in 1995, steady progress has been made in the implementation of the GPA. Particular progress has been achieved in identifying problems and issues requiring action to be taken at national and regional levels, and in furthering the objectives of regional co-operation. The GPA directly contributes to achieving the goals associated with the Millennium Declaration, and the Johannesburg Plan of Implementation.

At the First Intergovernmental Review Meeting, held in 2001, representatives of 98 governments expressed their concern that the marine environment is still being degraded to an increasing extent by pollution (including marine litter) from different sources. The GPA Coordination Office was encouraged to implement the adopted work programme at a strengthened level.

Litter is one of the nine pollution source categories identified in the GPA. Among other things, it is recommended that States identify and assess problems related to the severity and impacts of contaminants belonging to these categories which comprise: sewage; persistent organic

pollutants; radioactive substances; heavy metals; oils (hydrocarbons); nutrients; sediment mobilization; litter; and physical alteration & habitat destruction.

In an introduction to the marine litter problem given on the GPA Clearing-House Mechanism web site, examples are given of possible national, regional and international actions. International actions could, for example, include participation in a clearing-house on waste management, recycling and reuse, and waste-minimization technologies; and cooperation with countries in need of assistance, through financial, scientific and technological support, in developing and establishing environmentally sound waste-disposal methods and alternatives to disposal.

FAO Code of Conduct for Responsible Fisheries

The major UN Food and Agriculture Organization (FAO) programme on fisheries is aimed at promoting sustainable development of responsible fisheries and contributing to food security. The FAO Code of Conduct for Responsible Fisheries was adopted in 1995. Technical guidelines for the implementation of the Code have also been prepared by the FAO.

According to the Code, the management objectives include that appropriate measures should be taken to provide, *inter alia*, that "pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non- fish species, and impacts on associated or dependent species are minimized, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques". Management measures include that States should take appropriate measures to "minimize waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species".

States are also to ensure that "fishing is conducted with due regard to the safety of human life and the IMO International Regulations for Preventing Collisions at Sea, as well as IMO requirements relating to the organization of marine traffic, protection of the marine environment and the prevention of damage to or loss of fishing gear". Furthermore, States should "cooperate to develop and apply technologies, materials and operational methods that minimize the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear".

States should take measures to protect the aquatic environment – "introduce and enforce laws and regulations" – in accordance with the MARPOL 73/78 Convention. Owners, charterers and managers of fishing vessels "should consider fitting a shipboard compactor or incinerator to relevant classes of vessels in order to treat garbage and other shipboard wastes generated during the vessel's normal service. Moreover, they should "minimize the taking aboard of potential garbage through proper provisioning practices". Also, the crews of fishing vessels "should be conversant with proper shipboard procedures in order to ensure discharges do not exceed the levels set by MARPOL 73/78. Such procedures should, as a minimum, include the disposal of oily waste and the handling and storage of shipboard garbage".

The FAO is presently not directly involved in the problems of marine litter and for the last few years does not have any programmes on lost or discarded fishing gear. The Fisheries Industry Department of FAO has a Programme Entity entitled "Impact of Fishing on the Environment". This programme deals mainly with the physical impact of fishing gears on the seabed and the subject of unwanted and discarded catch. However, activities related to fisheries-related marine litter could be accommodated under this Programme.

At the recent conference on Derelict Fishing Gear and Related Marine Debris held in Hawaii, it was proposed that the FAO should resume its work on this issue. FAO and IMO have recently worked on a manual on the cleaning up of fishing harbours in the Bay of Bengal. Also, IMO and the FAO are working together on a revised Code of Safety for Fishing Vessels where the effects of litter could be included as an issue of concern.

2.1.2 Other global actors and initiatives

Intergovernmental Oceanographic Commission (IOC) of UNESCO

The IOC provides Member States with an essential mechanism for global co-operation in the study of the ocean. The IOC assists governments to address their individual and collective ocean and coastal problems through the sharing of knowledge, information and technology and through the co-ordination of national programmes. The IOC worked extensively with marine litter during the 1980s and 1990s. At present, however, the IOC has no ongoing projects in this field.

The systematic involvement of IOC in the problems of marine litter was initiated at the Sixth Session of the IOC Committee for the Global Investigation of Pollution in the Marine Environment (GIPME) in 1986, which recommended to the GIPME Groups of Experts to develop methodologies and facilitate efforts to monitor the amounts and types of persistent litter in the seas. Several activities were initiated following that recommendation, in the Mediterranean (1987-1991), the Caribbean (1994-1995) and the African Coast (1997-1999).

The main activities of the IOC in the Mediterranean were: organising, jointly with UNEP and FAO, a pilot survey in 1988 in five countries and evaluating the results of the survey; preparing a review of relevant activities by regional and international organisations; and preparing, jointly with UNEP and the FAO, an assessment of the state of pollution in the Mediterranean by persistent synthetic materials.

In the Caribbean the main activities were the development, in 1994, of a solid waste management action plan; and organisation of a marine debris workshop in 1995.

In Africa the main activities of the IOC were the launching of a pilot project on marine debris management for East African coastal countries in 1997; a mission in 1998 on waste management and marine pollution prevention in Southern and Eastern Africa; and work in the Gulf of Guinea region (workshop; survey and overview of waste management in ports/harbours).

Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection

The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) is a multidisciplinary body of independent experts nominated by sponsoring organizations (IMO, FAO, UNESCO-IOC, WMO, WHO, IAEA, UN, UNEP). Its mission is to provide advice to these organizations on pollution and other problems that face marine and coastal environments. The GESAMP report *Protecting the Oceans from Land-based Activities* addressed litter as one of the sources/categories. It notes that litter is found everywhere and that the ability to manage litter at a regional level is moderate. The priority actions recommended by GESAMP are improvement of urban and rural waste materials recycling; improvement of port reception facilities; development of more degradable packaging materials; and improvement of education/awareness.

International Coral Reef Initiative

Marine litter can have a serious negative impact on coral reef ecosystems. In particular, plastic items, including sheeting and bags, may cover reefs, blocking off the sunlight and oxygen that polyps need to survive. Heavy fishing gear can cause serious damage by tearing corals apart. The International Coral Reef Initiative (ICRI) is an environmental partnership that brings stakeholders together with the objective of sustainable use and conservation of coral reefs for future generations. It is an informal mechanism that allows representatives of over 80 developing countries with coral reefs to sit in equal partnership with major donor countries and development banks, international environmental and development agencies, scientific associations, the private sector and NGOs to decide on the best strategies to conserve the world's coral reef resources.

2.1.3 Global networks of international civil society organizations

International Coastal Cleanup

International Coastal Cleanup (ICC) is a global project, co-ordinated by the Ocean Conservancy, a U.S. non-governmental organization. It is an international network of environmental and civic organizations, government agencies, industries, and individuals working with the objective to remove marine litter (marine debris) and collect important information on the amounts and types of litter found on the beaches surveyed. This information serves to educate the public on marine litter issues and to encourage positive changes that will reduce litter and enhance the quality of aquatic environments.

The ICC organizes an annual, worldwide beach cleanup, and in the year 2002 over 390,000 volunteers in 100 countries took part, removing litter from over 19,000 kilometres (12,000 miles) of coastline and waterways. Almost 58 per cent of the litter found could be attributed to shoreline and recreational activities such as beach-picnickers and general littering.

Clean Up the World

“Clean Up the World” is the global outreach programme of Clean Up Australia, run in conjunction with UNEP. As UNEP noted in 2003: "Clean Up the World is a true example of community spirit and international cooperation, and UNEP is very proud to have been associated with it since its inception 11 years ago." Clean Up the World mobilizes more than 40 million people in 120 countries in clean up efforts. Clean Up the World is operating a special Clean Up Marine Debris initiative.

International Council of Cruise Lines

In 2001, the International Council of Cruise Lines (ICCL) adopted mandatory environmental standards for cruise ships. It was the first time an association of international passenger vessel operators had adopted mandatory Cruise Industry Waste Management Practices and Procedures. According to the environmental standards, ICCL members are committed to: "implementing a policy goal of zero discharges of MARPOL Annex V solid waste products (garbage) by use of more comprehensive waste minimization procedures to significantly reduce shipboard generated waste", and "expanding waste reduction strategies to include re-use and re-cycling to the maximum extent possible so as to land ashore even smaller quantities of waste products". More specifically, as spelled out in the Waste Management Practices and Procedures, ICCL member lines have agreed to "eliminate, to the maximum extent possible, the disposal of MARPOL Annex V wastes into the marine environment. This will be accomplished through improved reuse and recycling opportunities. They have further agreed that no waste will be discharged into the marine environment unless it has been properly processed and can be discharged in accordance

with MARPOL and other prevailing requirements." The waste types included are glass, cardboard, aluminium and steel cans.

2.2 Regional action, actors and initiatives on marine litter

2.2.1 UNEP Regional Seas Programme[1]

Mediterranean Sea

Legal framework

Marine litter has been an issue of concern in the Mediterranean since the 1970s. The Mediterranean countries adopted the Convention for the Protection of the Mediterranean Sea against Pollution (the Barcelona Convention) in 1976. Within the framework of this Convention the Mediterranean countries adopted a Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources in 1980. This protocol recognizes the importance of dealing with the problem of marine litter. In Annex I marine litter is defined as "Persistent synthetic materials which may float, sink or remain in suspension and which may interfere with any legitimate use of the sea". The Protocol was amended in 1996. Protocol Annex I defines as one of the categories of substances "Litter as any persistent manufactured or processed solid material which is discarded, disposed of, or abandoned in the marine and coastal environment".

The Mediterranean was designated a Special Area for the purposes of Annex V of the MARPOL 73/78 Convention. However, in the absence of adequate reception facilities, this provision has not yet entered into force.

Scientific research

The first scientific publication on marine litter in the Mediterranean was published in 1979 and was followed by a significant number of publications (see list of references). All these publications were mostly the results of the efforts of individual scientists and focused on specific aspects of the marine litter problem and/or specific localities in the Mediterranean (*e.g.*, Greece; Israel; Lebanon; Spain; the Eastern, Central and Western Mediterranean). These publications are an excellent source of data and information although they could not be used for producing clear regional pictures of the problems, due to various aspects covered and specific geographical locations. These studies were based on short-term surveys and geographically limited observations and, in addition, they were not conducted according to any standard methodology. This proved to be a major problem in making regional comparisons of marine litter pollution.

Activities of international intergovernmental organizations

The Sixth Session (1986) of the IOC Committee for the Global Investigation of Pollution in the Marine Environment (GIPME) recommended to the GIPME Groups of Experts to develop methodologies and facilitate efforts to monitor the amounts and types of persistent litter in the seas. Several activities were initiated following that recommendation in the Mediterranean, the Wider Caribbean and along the West African Coast.

UNEP/MAP, jointly with IOC and FAO, recognizing the lack of information on marine and coastal litter in the Mediterranean, convened an *ad hoc* meeting in 1987 on persistent materials. The meeting recommended that a pilot survey be initiated in selected Mediterranean areas. The

[1] Note: this is a representative sampling of activities taken by Regional Seas Conventions and Action Plans on marine litter issues, rather than an exhaustive listing of all Conventions' and Action Plans' activities.

pilot survey was organised in 1988 by UNEP/MAP, in cooperation with IOC and FAO, with five participating countries: Cyprus, Israel, Italy, Spain and Turkey. That pilot survey remains to date the most serious and systematic effort to assess the quantity, composition and origin of coastal litter in the Mediterranean Sea. Results of the survey were reviewed at the IOC/FAO/UNEP Review Meeting on the persistent synthetic materials pilot survey, which was held in 1989. This pilot survey can be considered a landmark activity for the assessment of marine and coastal litter in the Mediterranean.

A Comprehensive Bibliography on Marine Litter containing 440 references and an Assessment of the State of Pollution of the Mediterranean Sea by Persistent Synthetic Materials, which can Float, Sink or Remain in Suspension were published in 1991. The conclusions of the Assessment can be summarised as follows:

- The composition of coastal litter shows dominance of plastic materials (close to 75% of the total number of objects). The rest consists of litter pieces, which are made of metal, glass, lumber and wood, styrofoam and other materials. Floating litter consists almost entirely of plastics, styrofoam and wood, while seabed litter consists mostly of wood followed by plastics, metal and glass;
- It is difficult to quantify such a heterogeneous pollutant as litter in the marine environment. Findings of the MED POL pilot survey of persistent synthetic and other materials were not considered adequate to provide a quantitative assessment of the litter problem in the Mediterranean. However, the MED POL survey provided for the first time some indication of the quantities and the type of litter found on various beaches in five Mediterranean countries;
- The distribution of litter seems to be controlled by the following factors: proximity to the litter source which may be shipping lanes at sea, communities or human activities on land, winds and currents that disperse the litter from its source, and waves that move the litter from the front to the back of the beach; and
- Field data showed that most of the Mediterranean coastal litter is left by beach goers and therefore should be considered as land-based litter, whereas that of Northeast Atlantic beaches is mostly discarded from ships and therefore is marine-based.

The Eleventh Meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution and its Protocols, 1999, asked the Secretariat to begin action on marine and coastal litter and to prepare a relevant assessment. It also decided to include a budget line for the assessment of pollution of the Mediterranean Sea by litter.

Following the decision by the Contracting Parties, a Consultation Meeting on Marine and Coastal Wastes in the Mediterranean was held in 1999 and several documents were prepared. The meeting outlined a project on Marine and Coastal Litter Management, to be implemented in five phases. A general Questionnaire about Litter Management in Coastal Zones of the Mediterranean was sent to Mediterranean countries and the answers were analysed.

The Seventh Session of the IOC Committee for the GIPME, 1991, recommended that the methodology applied in the IOC/FAO/UNEP pilot survey in the Mediterranean should be "conducted on a widespread basis as a simple and effective technique for assessing the nature and sources of marine contamination by litter".

In 2003, UNEP/MAP, in cooperation with WHO, prepared Guidelines for Management of Coastal Litter for the Mediterranean Region. These guidelines were prepared within the framework of the Strategic Action Programme (SAP) for the Mediterranean and are intended to

help the responsible authorities, planners and field operators to place their national and regional development strategies within a context, which will allow them to protect the Mediterranean environment as best possible. These guidelines are to be used in the preparation and implementation of the National Action Plans for the Protection of the Marine Environment from Land-based Activities. UNEP/MAP continues to assist countries of the region to deal with the problems associated with management of marine litter.

Activities of non-governmental organisations

During the 1990's non-governmental organisations such as the Hellenic Marine Environment Protection Association (HELMEPA), the Centre for Marine Conservation (CMC) and Coastwatch Europe, have conducted surveys and beach cleanup campaigns yielding data and information on marine and coastal litter pollution of the Mediterranean Sea. These efforts, which continue to the present, are considered as a reliable source of data and information.

HELMEPA, a Greek non-governmental organization, was founded in 1982 with the aim to create environmental consciousness within the shipping industry "from ship owner to seafarer". Since 1983 HELMEPA has been launching annual public awareness campaigns, using means such as environmental exhibitions in various parts of the country, voluntary beach cleanups, TV spots, printed material and schoolchildren poster contests.

The HELMEPA JUNIOR programme was created in 1993. Since the founding of HELMEPA JUNIOR more than 25,000 schoolchildren and 1,000 volunteer teachers in 500 schools around the country have participated in the programme.

In 1989 HELMEPA organised a Workshop on the elimination of garbage from the Mediterranean and the designation of the Mediterranean as a Special Area for the purpose of Annex V to MARPOL 73/78. The proceedings of the Workshop contain a number of relevant papers. HELMEPA has also prepared documents and materials concerning the problems of marine litter. Using HELMEPA as a model, CYMEPA was established in Cyprus and TURMEPA in Turkey.

The International Cleanup Campaign (ICC) is co-ordinated by the Ocean Conservancy (see above, previously Centre for Marine Conservation or "CMC") and organised by country coordinators (mostly NGOs). Eleven Mediterranean countries have participated in the International Coastal Cleanup to date: Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Malta, Slovenia, Spain and Turkey.

The Mediterranean was not characterised as a "debris hot spot" in CMC's regional overview of marine debris "hot spots", which showed that debris from maritime activities is more prevalent in the Arabian Gulf, the Indian Ocean, the North Sea, the Red Sea and the Wider Caribbean. One of the most important findings of the ICC is that close to 80 % of the debris found on beaches is washed, blown, or dumped from shore. During the last few years it has been recognized that in many Mediterranean countries marine and coastal litter is not just a beach problem, it is a watershed problem too. Garbage that has been disposed of in rivers, or in dry riverbeds during the summer months, is often washed away by autumn rains and found even on faraway beaches.

In Greece, ICC cleanup campaigns have been organised by HELMEPA since 1993. In 2002 in Greece 1,667 volunteers participated in the ICC cleanup campaign. Volunteers cleaned 29 km of shoreline and waterways, picking up 46,038 pieces of debris, weighing 25 tons. Simultaneously 172 divers removed 22 tons of debris from seabeds.

Within the framework of the Mediterranean Cooperation Programme of HELMEPA-MEDSPA and the MAP/REMPEC voluntary beach cleanups were organised in September 1991 and 1992

in Cyprus, Israel and Greece and in 1993 in Greece, Israel, Italy, Spain and Turkey. In 1995-1996 HELMEPA carried out an EC LIFE Project, which comprised cleanup activities in seven geographical areas in Greece covering a total of 68 beaches. The beaches were cleaned twice a year, before and after the summer season.

The Professional Association of Dive Instructors (PADI) in Europe coordinates a regional underwater cleanup, as part of the CMC International Coastal Cleanup and PADI's environmental Project AWARE.

Wider Caribbean

Marine litter has been an issue of concern nationally as well as internationally in the Wider Caribbean region for many years. As in most other regions, the problems are closely associated with deficiencies in the management of waste from sea-based as well as land-based sources.

In order to tackle marine litter from land-based sources, "persistent synthetic and other materials, including garbage, that float, flow or remain in suspension or settle to the bottom and affect marine life and hamper the uses of the sea" were included as a so-called Primary Pollutant of Concern in Annex I to the Protocol Concerning Pollution from Land-based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention). The Protocol was adopted in 1999.

Apart from co-ordinating the implementation of the Protocol, the UNEP Caribbean Environment Programme (CEP) has worked or is presently working on a number of projects and programmes of relevance to marine litter. These include:

- Solid Waste and Wastewater Management for the Tourism Industry;
- Coastal Tourism in the Wider Caribbean Region: Impacts and Best Management Practices;
- Sewage Treatment Operators Manual for the Caribbean Region; and
- Environmentally Sound Tourist Facility Design and Development for the Tourism Industry.

According to an overview published by the CEP, "increasing amounts of solid wastes are generated within the Wider Caribbean region, coupled with deficient collection systems and inadequate disposal practices. Additionally, disposal of solid wastes originating from ships and other offshore sources are impacting the coastal areas of the region. The increasing amounts of solid wastes in the coastal zone are detrimental to the economies of many countries, especially those dependent on the tourist trade. […] The land based solid waste pollution has its origin in inadequate disposal practices, such as using rivers and streams and mangrove swamps as dumpsites. Poorly managed landfills in coastal areas can also become sources of debris, especially in the rainy season, when runoff may wash wastes out to sea. At present there is little published information available about the amount of solid wastes generated in the Wider Caribbean region, and about how these wastes are handled prior to final disposal. Solid wastes dumped at sea come from shipping, commercial fisheries, and other offshore activities.

"The disposal of solid wastes by ships in near shore coastal areas is regulated by Annex V of the MARPOL 73/78 Convention. In 1992, the Maritime Environment Committee of IMO designated the Wider Caribbean region as a "Special Area" for the purpose of Annex V. However, in order to comply with Annex V of MARPOL, countries in the region will need to provide port reception facilities for Annex V wastes generated by shipping activities. At present, many countries in the

region lack such facilities and, as a result, the Special Area provisions for the Wider Caribbean have not yet entered into force. The lack of adequate port reception facilities could result in solid wastes being disposed of at sea, and being transported by wind and currents to shore often in locations distant from the original source of the material. Ship generated wastes account for approximately 80% of solid wastes in the coastal areas."

The serious concern felt by many people throughout the region about the problems caused by marine litter is also reflected by the fact that groups and organisations (including some government agencies) in no fewer than 23 countries in the region take part in the International Coastal Clean-up programme.

The cruising industry is a major maritime actor in the Wider Caribbean. Large cruising ships generate large quantities of garbage. The lack of adequate reception facilities in many, if not most, ports in the region is a particularly acute problem for most of the small island developing States, whose ports are frequently visited by cruising ships. Members of the International Council of Cruise Liners (ICCL) (see above) include shipping companies whose vessels account for approximately 90 per cent of the North American passenger cruise line industry, most of which are in the Wider Caribbean. Thus, the mandatory environmental standards of the ICCL, including the Cruise Industry Waste Management Practices and Procedures, are highly relevant to the marine and coastal environment of the Wider Caribbean.

Northwest Pacific (NOWPAP)

In an overview of the state of the environment in the Northwest Pacific region (NOWPAP), the region is described as "among the most highly populated parts of the world, resulting in enormous pressures and demands on the environment. Its people are particularly dependant on the sea for their food and livelihoods. Yet their health – and the health of their environment – is under growing threat, mainly from land-based activities and sources of pollution. Coastal development, industry, transport, and activities such as land reclamation and intensive mariculture take an ever-increasing toll on coastal ecosystems. Chemical and industrial wastes, untreated municipal sewage, agricultural pesticides and nutrients in run-off cause widespread damage and stimulate eutrophication and harmful algal blooms (red tides). Added to these are oil pollution from wastewaters and accidental spills, atmospheric pollution and marine and coastal litter."

Marine litter has become a major environmental concern of the NOWPAP member countries. Due to the transboundary character of marine litter, there is a clear need to develop regional programmes dealing with marine litter. Plans to develop joint initiatives to combat and reduce marine litter and its harmful and costly effects are presently being developed within the NOWPAP programme of work for 2004/2005. Once launched, the co-operation between China, Japan, Korea and Russia is expected to lead to a slow but gradual improvement of the situation. The programme will consist of two major elements. The generation of marine litter will be reduced at source by implementing better waste management strategies and practices, and large-scale cleanup campaigns will be run as part of public awareness and education activities. The NOWPAP countries are expected to contribute efforts and resources to the marine litter work beyond the scope of present NOWPAP activities.

2.2.2 Other regions

North-East Atlantic (OSPAR)

Marine litter in the marine and coastal environments has been an issue of concern in the North-East Atlantic region, and particularly in the North Sea sub-region, during at least the last two decades. People in most of the countries of the region have become increasingly aware of and concerned about the effects of marine litter. As a result, these effects have been well documented throughout the region. Coastal and beach clean-up operations are being conducted on a regular basis in most of the countries. These are mostly carried out by local communities and non-governmental organizations – and at high costs.

Marine litter has been on the agenda of the regional and sub-regional intergovernmental co-operation since the late 1980s. The co-operation takes place within the framework of the OSPAR Commission (for the Protection of the Marine Environment of the North-East Atlantic) for the OSPAR Convention, and the North Sea Conferences (International Conference on the Protection of the North Sea). This was most recently demonstrated in 2002 at the Fifth North Sea Conference, and in 2003 at the OSPAR Ministerial meeting.

Following an initiative by the OSPAR countries, the IMO Marine Environment Protection Committee (MEPC) in 1989 decided to designate parts of the Northeast Atlantic (the North Sea, the Skagerrak, the Kattegat, and the English Channel) as a Special Area for the purpose of Annex V of MARPOL 73/78.

With the exception of Norway and Iceland, the OSPAR countries are members of the European Union and, thus, obliged to implement EU legislation. EU legislative acts of relevance to marine litter include the EC Directive on Port Reception Facilities for Ship-generated Waste and Cargo Residues, and the EC Directive on Landfills (see below: 2.2.3 Other regional organisations: European Union).

However, despite these measures taken in the region, there does not seem to have been any significant improvement in the situation concerning marine litter during the last ten years. This is concluded in the OSPAR Quality Status Report (QSR, 2000), the regional assessments of the state of the marine and coastal environment. Reports from some parts of the OSPAR region actually indicate that the marine litter problem is still increasing.

Priorities for further actions by the appropriate international, national and local authorities identified in the QSR include the following:

- Adequate enforcement of the requirements of MARPOL Annex V, including the responsibility of governments of countries around a Special Area to ensure that adequate reception facilities are provided at ports and terminals for the reception of garbage;
- Rapid adoption, implementation and adequate enforcement by EU member states of the EC Directive on Port Reception Facilities for Ship-generated Waste and Cargo Residues;
- Consideration of the designation of a larger part of the OSPAR Maritime Area as a MARPOL Special Area;
- Campaigns to educate the public and those involved in tourism, fishing and shipping industries on the issue of marine litter; and
- Relocation and/or improved management of coastal landfills from which garbage may escape to the sea.

According to the QSR, "improved and more standardized methodologies, including the establishment of reference areas will be needed to properly assess the scale and impact of litter both on coasts and offshore. These in turn will provide a basis for assessing trends in quantities and significance of litter throughout the OSPAR area." As a response to this, the six-year OSPAR Pilot Project on Monitoring Marine Beach Litter was initiated in 1999. Now in its second phase (2003–2006), the project includes close to 40 reference beaches in eight countries, which are surveyed 3–4 times a year according to an agreed protocol.

Civil society actors in the Northeast Atlantic region include a number of national and international networks of environmental organizations, *e.g.*, the Marine Conservation Society (UK), Stichting de Noordzee (Netherlands), and Coastwatch Europe.

The goal of the six-year "Save the North Sea" project is to reduce marine litter by changing the attitudes and behaviour of people using the area. The project is partly funded by the EU INTERREG programme. Project partners include non-governmental organisations and research institutes in Denmark, the Netherlands, Norway, Sweden and the United Kingdom.

2.2.3 Other regional organisations

European Union

Waste management (Sustainable use of natural resources and waste) is one of four priority issues in the EU Sixth Environment Action Programme (2001–2010).

Management of waste on land

According to the EC Directive on Waste, Member States "shall take appropriate steps to encourage the prevention, recycling and processing of waste, the extraction of raw materials and possibly of energy there from and any other process for the re-use of waste. They shall inform the Commission in good time of any draft rules to such effect and, in particular, of any draft rule concerning the use of products which might be a source of technical difficulties as regards disposal or lead to excessive disposal costs; the encouragement of the reduction in the quantities of certain waste; the treatment of waste for its recycling and re-use; the recovery of raw materials and/or the production of energy from certain waste; the use of certain natural resources, including energy resources, in applications where they maybe replaced by recovered materials.

“Member States shall take the necessary measures to ensure that waste is disposed of without endangering human health and without harming the environment, and in particular: without risk to water, air, soil and plants and animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest."

The EU has also adopted a specific Directive on Landfills. The objective of this Directive is, by way of stringent operational and technical requirements on the waste and landfills, to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from land-filling of waste, during the whole life-cycle of the landfill.

EU Marine Strategy

In the EU Sixth Environment Action Programme it is stipulated that a thematic strategy for the protection and conservation of the marine environment with the overall objective to "promote the sustainable use of the seas and conserve the marine environment" should be developed. This multi-stakeholder development process has started with the Commission presenting a Communication to the Council and the European Parliament, and the strategy is expected to be adopted in 2005.

Contamination by marine litter is highlighted as a general problem in all European seas. The main sources are identified as shipping (fishing and commercial shipping) and tourist/recreational activities. It is also noted that, in addition to other well-known impacts of litter on marine life, marine litter has been found to carry a variety of epiphytic organisms to sea areas that these organisms would normally not reach. It is also emphasized that the litter problem may get worse as pressure for tourism, urban and industrial development in the coastal zone increases.

The proposed Objective 8 of the European Marine Strategy is "to eliminate marine litter arising from illegal disposal at sea by 2010". According to the Draft Action 13 of the strategy: "Where the implementation of the previously mentioned directive [on port reception facilities] is also relevant in reducing litter, the Commission will, in addition, by 2004, and in collaboration with all relevant organisations, prepare a report on the extent and sources of marine litter and consider possible remedial measures".

EU Directive on Port Reception Facilities for Ship-generated Waste and Cargo Residues

The Directive was adopted in 2000. The objective is to "reduce the discharges of ship-generated waste and cargo residues into the sea, especially illegal discharges, from ships using ports in the Community, by improving the availability and use of port reception facilities for ship-generated waste and cargo residues, thereby enhancing the protection of the marine environment." The Directive is one of the measures forming part of the EU policy on safe and clean seas.

The EU "is seriously concerned about the pollution of seas and coastlines of the Member states caused by discharges of waste and cargo residues from ships, and in particular about the implementation of MARPOL 73/78". All EU Member States have ratified MARPOL 73/78.

The Directive is aimed at ensuring a major reduction in marine pollution by the provision of adequate waste reception facilities in all EU ports, including recreational ports and marinas. In addition, it requires all ships, fishing vessels and recreational crafts visiting these ports to make use of the facilities provided. More specifically, the Directive: requires all ports and marinas to provide adequate reception facilities for ship-generated waste and cargo residues; requires a waste management plan to be developed for each port which is monitored and approved by Member states; ensures that fee systems adopted by ports will encourage vessels to use the facilities rather than discharge their wastes at sea; requires ships to notify their intention to use facilities and quantities of waste on board before arriving in port; requires Members States to monitor compliance with the Directive and apply sanctions; and requires authorities to forward information on non-compliance to other EU ports which such ships may intend to visit.

2.3 National action, actors and initiatives on marine litter

There are numerous examples of activities to deal with the marine litter problem in many other regions and countries throughout the world. It has not been possible within the scope of this feasibility study to reflect or review this variety of activities. Therefore, in this section only a few examples from selected countries are presented as examples of what can be done at the national level to manage marine litter.

Sweden

Sweden has experienced very large problems with marine litter for decades, particularly along its west coast. Due to the prevailing current and winds in the North Sea area, the Skagerrak coastal area (which comprises only about two per cent of the total North Sea coastline) receives about 10 per cent of marine litter. During the 1990s, the amount of marine litter removed from the beaches annually was on average 6,000–8,000 m^3. The annual beach cleaning operations are mainly conducted by and paid for by the local municipalities.

The overall Swedish environmental legislation is laid down in the Environmental Code, which brings together 15 previous central environmental laws. The aim of the Code, which came into force in 1999, is to promote sustainable development based on the notion that nature should be protected in its own right and that humanity's right to exploit nature carries with it responsibility for one's actions.

According to the Environmental Code, the responsibility for collecting garbage and for transporting waste to treatment facilities (with the objective to adequately protect human health and the environment) rests with the local municipalities. All municipalities are obliged to elaborate local waste management plans, which should include descriptions of actions taken to ensure that waste is managed in an environmentally sound way.

Ports that can be accessed by ships larger than 1,350 gross tonnes need a permit in accordance with the Environmental Code.

Management of waste from ships is regulated by the Law on Pollution from Ships. The Swedish Maritime Administration issues detailed regulations on the implementation.

All Swedish sea areas are covered by MARPOL Annex V Special Areas (for the Baltic Sea to the east and the south, and the North Sea to the west). Consequently, all discharges of garbage are prohibited in Swedish waters. Similarly, all Swedish ports are required to provide reception facilities for all types of ship-generated waste, including garbage. The cost for receiving the waste from ships must be included in the overall harbour fee (no special fee for the reception of ship-generated waste is allowed).

The operators of a reception facility (a municipality or a private operator) must develop a waste management plan, in consultation with the local authorities. Detailed advice on what should be included in a plan has been issued by the Swedish Maritime Administration.

Before a ship is allowed to sail from a Swedish port, it must deliver to a reception facility all the waste that is generated from the normal operation of the ship and that must not be discharged at sea. The port must receive the waste and the local municipality must accept the responsibility for further management and treatment. To assist ports and ship operators, the Swedish Maritime Administration has published a handbook on reception facilities and regulations on waste

handling in ports. The Administration has also prepared regulations and information on waste management in marinas.

United Kingdom

The UK national legislation of relevance to marine litter includes the Environment Act, the Merchant Shipping (Prevention of Pollution) Regulations, the Merchant Shipping (Port Waste Reception Facilities) Regulations, and the Merchant Shipping (Prevention of Pollution by Garbage) Regulations.

Under the Environment Act, competent authorities are responsible for keeping their land clear of litter. The bodies responsible include local authorities, government departments and statutory undertakers (*e.g.*, railways). As part of this, all local authorities have the duty to remove litter from the mean high water spring line and above from amenity beaches (from May to September). It is also an offence to drop litter in any public place, including beaches.

The Merchant Shipping (Prevention of Pollution) Regulations of 1996 created a "pollution zone" extending out to 200 nautical miles from the UK coast. Any foreign ship suspected of committing a pollution offence within the "pollution zone" will be liable to prosecution.

The Merchant Shipping (Port Waste Reception Facilities) Regulations of 1997 require all ports and terminals in the UK to provide adequate reception facilities for waste, including dry waste and oil; and to prepare a waste management plan to be approved by the Secretary of State.

The Merchant Shipping (Prevention of Pollution by Garbage) Regulations of 1998 implement Annex V of MARPOL 73/78 and prohibit UK ships, fixed and floating platforms and foreign ships in UK waters disposing of plastics anywhere in the sea. Apart from food waste, no garbage may be disposed of in the North Sea. Elsewhere, other types of garbage may be disposed of at specified distances from the nearest land.

The Maritime and Coastguard Agency (MCA) has addressed marine litter from shipping. For example, the MCA has conducted a Pilot Project to Establish Methodologies and Guidelines to Identify Marine Litter from Shipping; and made a Survey of Waste Reception Facilities in UK Ports. Furthermore, the MCA has prepared a booklet on Port Waste Management Planning: A Guide To Good Practice.

The non-governmental organization Marine Conservation Society (MCS) is co-ordinating two major programmes on marine litter in the UK – Beachwatch and Adopt-a-Beach. Beachwatch was launched by MCS in 1993 to raise awareness about the problem of marine and coastal litter, monitor levels and sources of litter and encourage action to reduce marine litter at source. In 2002, 229 beaches throughout the United Kingdom were cleaned. The Adopt-a-Beach project, established in 1999, encourages individuals, groups and communities to carry out regular beach litter surveys and work on litter issues at the local level.

United States of America

The Shore Protection Act of 1989 provides for controls on operations relating to the vessel transport of certain solid wastes (municipal or commercial waste) so that those wastes are not deposited in coastal waters. This act has provisions that reduce wastes being deposited in coastal waters during the transfer of waste from the waste source to the transport vessel to the waste station.

As amended by the Water Quality Act of 1987, the Clean Water Act requires the U.S. Environmental Protection Agency to establish regulations that treat storm water and combined sewer overflows as point source discharges that must be regulated under the National Pollutant Discharge Elimination System (NPDES). The permits will prohibit non-storm water discharges into storm sewers while leading to improved control techniques and best management practices.

The United States has ratified both the MARPOL 73/78 Convention and the London Convention.

The Marine Plastic Pollution Research and Control Act (MPPRCA) provides the legal basis to implement MARPOL Annex V in the United States. It applies to foreign vessels in U.S. waters, and U.S. vessels anywhere in the world. Under the Act, throwing plastic off any vessel within the U.S. Exclusive Economic Zone is illegal. It is also illegal to throw any other garbage overboard while navigating U.S. waters (including inland waters) or within three miles off shore. Fewer restrictions apply to non-plastic garbage farther from shore, but the dumping of plastics overboard in any waters, anywhere, is always illegal.

The Environmental Protection Agency (EPA) *Innovations in Coastal Protection: Searching for Uncommon Solutions to Common Problems,* more commonly referred to as the "coastal cookbook", is an organized collection of successful coastal protection initiatives from across the U.S.

The EPA, along with other federal agencies, has designed the National Marine Debris Monitoring Program (NMDMP), and the EPA is supporting the implementation of the study by the Ocean Conservancy. The NMDMP is designed to gather scientifically valid marine debris data following a rigorous statistical protocol. The goal is to identify trends in the amounts of marine debris affecting the U.S. coastline and to determine the main sources. The U.S. has been divided into nine regions. 20 coastal sites are being selected within each region where sampling of marine litter will be conducted. To date, 163 study sites have been designated and 128 sites are collecting data. The surveys will measure trends of 30 specific items found within each 500-meter site by sampling monthly for a period of five years by teams of trained volunteers.

The U.S. component of the International Coastal Cleanup (see 3.1.3 Global networks of international civil society organizations) comprises clean-up activities in all coastal U.S. states, including those bordering the Great Lakes. In 2002, more than 165,000 volunteers cleaned U.S. beaches with a length of approximately 14,000 km removing about 1,800 tonnes of marine litter.

Australia

There are numerous reports about the litter situation from various parts of Australia. The quantities and types of marine litter found seem to be similar to those found on European beaches, with one major exception. According to a report published in 2003, up to 90 per cent of the marine debris on the northern Australian coast (in the Arafura Sea, *e.g.*, sandy beaches on Arnhem Land) originates from marine sources, mainly from fishing operations and with a large part (roughly 79 per cent) coming from non-Australian sources and only about 21 per cent from Australian sources.

As a result of the widespread concern about marine litter in Australia, the country has enacted a number of legislative acts and regulations that directly or indirectly address marine litter issues. A number of NGO initiatives and programmes, and beach cleaning and awareness activities, are undertaken in many parts of Australia.

The responsibility for addressing litter relevant issues is divided between the Commonwealth (the federal level) and States/Territories.

The National Oceans Office is responsible for Australia's Ocean Policy, under which the government will undertake action to enable marine species threatened with extinction to survive and thrive in their natural habitats and prevent additional species and ecological communities from becoming threatened by identifying and managing critical threats; and prevent adverse impacts of pollution on the marine environment.

In the Australian Environment Protection and Biodiversity Conservation Act of 1999, "injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris" are listed as a key threatening process. This listing is expected to lead to the development of a Threat Abatement Plan for the process.

The Department of Environment and Heritage is in charge of the Plastic Bag Campaign: "Plastic bags are of significant concern in marine and other aquatic environments, as aquatic life can be threatened through entanglement, suffocation, and ingestion. The Department recognises that plastic bag litter is a serious environmental concern, and is currently working with state and territory governments, industry, and the community to undertake a package of actions to reduce the impact of plastic bags on the Australian environment. Australian state and territory environment ministers have asked all Australians to work towards the goal of reducing plastic bag litter by 75 per cent by the end of 2004 and to reduce plastic bag use by 50 per cent".

The Department's Marine Waste Reception Facilities Program (MWRF) is designed to assist ports and marine facilities to assess their need for waste reception facilities, and to assist in the funding of demonstration projects and development of best practice management guidelines. The Program will "deliver and publish best practice facilities for marine waste reception at selected ports, marinas and boat harbours in all coastal States and Territories. In co-operation with the States, Territories, Local Governments and industry, the Program aims to minimise pollution from ships and boats". The MWRF Program is funded through the Coasts and Clean Seas Program, the objective of which is to tackle Australia's marine and coastal environmental problems.

The Department is, furthermore, responsible for the Plan for Marine Turtles. The recovery plan identifies marine debris as a cause of "death and debilitation of marine turtles and other marine wildlife" and states that "identifying the sources of marine debris, responding to stranding events and quantifying mortality caused by marine debris" are the "primary actions to monitor and manage debris as a threat to turtles".

As part of its Vessel Waste Management Campaign, the Australian Maritime Safety Authority (AMSA) has published brochures on good waste management practices on vessels. AMSA also maintains directories of waste reception facilities in ports.

The Australian and New Zealand Environment and Conservation Council (ANZECC) has published *Best Practice Guidelines for Waste Reception Facilities at Ports, Marinas and Boat Harbours in Australia and New Zealand*. These guidelines provide practical advice on the implementation of the MARPOL regulations. They are to be implemented by state/territory governments and local councils through licensing and approvals. The key principles of the Guidelines include waste avoidance, reduction, segregation, reuse, recycling, treatment and disposal.

The objective of ANZEC's National Strategy to Protect the Marine Environment is to strengthen the protection of the marine environment by promoting best practices, improving waste

management, reducing pollution from shipping and communicating effectively with the shipping sector about environmental issues. Objective 5 of the Strategy is to promote reduction and eventual elimination of ship-sources marine debris by reviewing the nature and extent of marine debris and waste problems; and developing and implementing strategies to monitor waste and debris and reduce and manage waste.

The voluntary Code of Conduct for Responsible Seafood Industry, for all aspects of the seafood industry, developed by Seafood Services Australia, has been prepared based on the FAO Code of Conduct for Responsible Fisheries. The voluntary National Code of Practice for Recreational Fishers, developed by RecFish Australia, includes 12 principles for conserving fish stocks. Included are also specific references to the prevention of marine debris.

Clean Up Australia Day, which has been organized by Clean Up Australia since 1990, has been very successful at cleaning beaches along the Australian coast. Unfortunately little information is recorded on the types and quantities of litter collected. As mentioned previously, the global initiative Clean Up the World is the global outreach programme of Clean Up Australia, in conjunction with UNEP. World Wide Fund for Nature, WWF, Australia, is co-ordinating marine debris surveys and clean-ups in partnership with local volunteer groups in several places in northern Australia.

Republic of Korea

According to a recent comprehensive report describing the problem of marine litter in the Republic of Korea, marine litter has become a serious environmental, economical (especially for fisheries) and social problem. In order to address the issues involved, practical management strategies have been developed with the objective to control the input from shipping (fisheries activities) and land (through rivers), to assess potential impact of marine litter on marine environments and fishery resources, and to clean up the accumulated debris on the seabed.

The Republic of Korea has several national policies for the management of marine litter. Since the late 1990s, the Government has initiated special national research and development projects to develop integrated management strategies and practical guidelines on how to tackle marine litter problems at the national level. These projects have mostly been carried out by the Korea Research Institute of Ships and Ocean Engineering (KRISO)/Korea Ocean Research and Development Institute (KORDI). The projects include:

- Surveys of marine litter in ports and coastal regions, including important fishing area;
- Clean-up of marine litter;
- Prevention of the input of marine litter to coastal environments, especially from land-based sources;
- Technical development of equipment and facilities for surveys and clean-up of marine litter;
- Prevention of input, treatment for re-use and disposal of collected materials; and
- Relevant legal and institutional re-arrangements.

In addition, extensive educational programmes for raising public awareness about marine litter have been conducted.

3. ANALYSIS AND AREAS FOR POTENTIAL ACTION

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3.1 Analysis

Marine litter originates from many sources and causes a wide spectrum of environmental, economic, safety, health and cultural impacts. The situation, globally as well as regionally, does not seem to be improving, despite actions taken globally, regionally and by a number of individual countries. Some regions and countries even report that the situation with regard to marine litter continues to deteriorate.

Measures to reduce or prevent marine litter are part of waste management in society as a whole. People who are waste-wise in general, and who realize that waste is a common problem and not one that someone else should take care of, will have the same responsible attitude towards the handling of waste that could end up as marine litter. Good waste management must begin with preventing waste being generated – what is never produced does not have to be disposed of and cannot become marine litter. The second step is to collect waste that has already been generated and make sure it is being taken care of properly, either for reuse and recycling of materials and products (to as large an extent as possible) or for disposal in a manner that is as safe as possible from an environmental and health point of view.

Today, there is generally a lack of appropriate management of waste from the place where the waste is produced to the final disposal or processing of the waste. However, marine litter is not

only an environmental problem that can be solved solely by means of legislation, law enforcement and technical solutions. It is also a cultural problem and has to be addressed as such, namely by efforts to change attitudes, behaviours, management approaches, education and involvement of all sectors/interests, including the public at large. Thus, there is no single solution to the marine litter problem. Rather, marine litter should be addressed through a wide range of carefully targeted and integrated measures.

A thorough review and analysis should be made of the potential for using already existing structures, instruments and tools. Solid waste management is addressed in most of the regional action plans or programmes, as well as in the legally binding protocols on land-based sources of pollution in regions where such protocols exist.

3.2 Possible tools and activities to address marine litter

Based on the information gathered and reviewed in the present study, and the consultations held with relevant organizations, it can be concluded that a wide range of marine litter-related actions and activities have already been taken or are presently being implemented at the global and regional levels. At the national level, a number of countries have taken comprehensive action to address the marine litter issues through legislation, enforcement of international agreements, providing reception facilities for ship-generated wastes, improving their waste management practices and supporting extensive beach-clean up activities, as well as information, education and public awareness programmes.

3.2.1 Possible global tools and activities to address marine litter from sea-based sources

Assessment of MARPOL Annex V effectiveness • Better reception facilities and waste management

The MARPOL 73/78 Convention and its Annex V on garbage is the main international instrument to control marine litter pollution from shipping, including fishing vessels and leisure craft. Properly implemented and enforced by the Contracting Parties at the national level, the provisions of Annex V should result in a significant reduction (and eventual elimination) of the input of marine litter from the shipping sector.

Annex V has been in force for many years and a number of regions have been designated as Special Areas for the purpose of Annex V, but solid waste items from shipping (including fishing vessels and leisure craft) still constitute a significant proportion of the marine litter found in the marine and coastal environments.

No overall assessment of the general effectiveness of Annex V seems to have been made, however. Neither has any assessment been made of the effectiveness of Annex V in those regions which have been designated as Special Areas. Such assessment could be made and used as a basis for further action, *e.g.*, for the possible designating of additional sea areas as Special Areas for the purpose of Annex V.

It seems that Annex V waste types are managed properly onboard most large vessels (it is not as clear how such waste is managed onboard fishing vessels and leisure craft). It would, nevertheless, be important to ensure that garbage record books and waste management plans are properly inspected when ships are inspected according to the port state control regulations.

The fundamental provisions of Annex V are:

- That ships should comply with the at sea discharge provisions and deliver the remaining wastes ashore;
- That reception facilities for ship-generated waste, including garbage, should be generally available and conveniently located, so that ships using these are not unduly delayed; and
- that ships should deliver all their waste ashore and ports receive the garbage (at no extra charge or causing the ships to spend additional time in port).

The fact that reception facilities for ship-generated waste, including solid waste and garbage, are lacking or insufficient in many harbours is the major bottleneck in better implementation and enforcement of MARPOL Annex V. Thus, improvement of port reception facilities and better management of the waste delivered ashore could be a potential and important area through which to address marine litter. This will require major investments in infrastructure (reception facilities) in ports throughout the world, as well as in environmentally sound management of the waste once it has been delivered ashore.

Monitoring of compliance with no-dumping regulations for plastics

The dumping at sea of wastes (as a cargo) that have been loaded on ships for the purpose of dumping is regulated by provisions in the London Convention. The prohibition on dumping of all forms of plastics is of particular importance from a marine litter perspective. The LC Secretariat should monitor closely (*e.g.*, via the reporting by the Contracting Parties of dumping permits issued) the compliance with the regulation banning the dumping of plastics.

Highlighting the requirements for fishing-gear responsibility of fishers

Implementation of the Code of Conduct For Responsible Fisheries is a high priority issue for FAO, globally and regionally. In this process, the requirements to minimize loss of fishing gear, the responsibility to recover lost gear, and to deliver damaged gear to port for destruction, should be continuously highlighted. It would be particularly relevant to raise these issues at the meetings of the FAO regional fisheries bodies and in fisheries development projects implemented by FAO and its subsidiary bodies. In this work, it should be highlighted that MARPOL 73/78, including Annex V, is fully applicable to fishing vessels.

3.2.2 Possible regional tools and activities to address marine litter from sea-based sources

Assessments of MARPOL 73/78 Annex V effectiveness, and status of reception facilities, in the Mediterranean, the Wider Caribbean and the North-East Atlantic

In all three areas, it may be valuable to make assessments, in co-operation with the IMO, of the effectiveness of the implementation of MARPOL Annex V. In the Mediterranean region, the regional partner would be Mediterranean Action Plan Coordinating Unit (MEDU), in the Wider Caribbean region the Caribbean Environment Programme (CEP), and in the North-East Atlantic the OSPAR Commission.

Also, as co-operation projects between a regional partner and the IMO, it would be valuable to make assessments in all three regions of the availability of reception facilities for ship-generated waste, particularly solid waste and garbage, in ports and marinas.

3.2.3 Possible global tools and activities to address marine litter from land-based sources

UNEP Global Programme of Action on the Protection of the Marine Environment from Land-based Activities, UNEP/GPA

As marine litter is one of the pollution source categories of the Global Programme of Action on the Protection of the Marine Environment from Land-based Activities, objectives or targets have been set for marine litter. These include that controlled and environmentally sound facilities for receiving, collecting, handling and disposing of litter from coastal area communities should be established, and that the amount of marine litter reaching the marine and coastal environment should be reduced significantly by the prevention or reduction of the generation of solid waste and improvements in its management, including collection and recycling of litter.

Promotion of the marine litter issue in the implementation or development of regional convention protocols on land-based sources

The GPA Secretariat can expand and amplify its ongoing litter-related activities in a variety of areas:
• Provide information and stimulate exchange of information about marine litter issues through the GPA Clearing-House node (Global Marine Litter Information Gateway); • Ensure that land-based sources of litter are adequately taken into account in the implementation of the protocols on land-based sources to the Regional Seas Conventions, or when such protocols are being developed; and • Co-operate with countries in need of assistance, through financial, scientific and technological support, in developing and establishing environmentally sound waste-disposal methods and alternatives to disposal.

Strategy for sound management of hazardous waste in relation to the marine environment

As part of the work of the Basel Convention on Transboundary Movements of Hazardous Wastes, an evaluation of the impacts on the marine environment of hazardous wastes and other wastes could be made, so as to conveniently develop a strategy for the environmentally sound management of hazardous and other wastes (including lead acid batteries, biomedical and healthcare wastes, municipal waste and industrial waste) to reduce the impacts on the marine environment.

Marine litter in future global assessments of the state of the marine and coastal environment

Litter was included as one of the sources/categories considered in the 2001 report *Protecting the Oceans from Land-based Activities,* compiled by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP).
It would be important that marine litter continues to be included as an issue in future global assessment of the state of the marine and coastal environments.

3.2.4 Possible regional tools and activities to address marine litter from land-based sources

Implementation of the regional Protocols on land-based sources, with respect to marine litter • National action in global (GPA) perspective

In both the Mediterranean region and the Wider Caribbean region, it would be essential to have the regional protocols on land-bases sources (to the Barcelona Convention, and the Cartagena Convention, respectively) fully and effectively implemented, with respect to marine litter. In the Mediterranean region, the Mediterranean Action Plan Coordinating Unit (MEDU) would be instrumental in this, and in the Wider Caribbean region the Caribbean Environment Programme (CEP) would. In the Mediterranean region, the implementation of the provisions set out in the Guidelines for Management of Coastal Litter for the Mediterranean Region is also of utmost importance.

Within the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), as a global UN initiative, possible actions to be taken at the national level to improve waste management are listed:

- Introduction of appropriate measures to encourage reduction in the generation of solid wastes;
- Establishment and ensuring the proper operation of solid waste management facilities on shore for wastes from all sources, including shipping and harbour wastes;
- Development and implementation of national plans for wise waste management;
- Formulation and implementation of awareness and education campaigns for the general public, industry, and municipal authorities, as well as recreational and commercial vessels, on the need to reduce waste generation and the need for environmentally sound disposal and reuse;
- Increasing local planning and management capacity to avoid location of waste-dump sites near coastlines or waterways or to avoid litter escape to the marine and coastal environment;
- Formulation and implementation of improved management programmes in small rural communities to prevent litter escape into rivers and the marine and coastal environment; and
- Establishment of campaigns and /or permanent services for collecting solid wastes that pollute marine and coastal areas.

3.3 Improvement of the common knowledge base

There are still significant gaps in our knowledge about the global marine litter situation. Geographically, the information available is also very unevenly distributed. In order to provide a solid basis for action at the global, regional and national levels, there is a strong need to improve and consolidate the knowledge base on marine litter through further research and monitoring activities. This holds particularly true regarding the socio-economic aspects of marine litter.

Long-term and well-designed research and monitoring programmes and studies will be required to detect and determine statistically significant trends in the composition, quantities and effects of marine debris. Results from such studies will be needed as a basis for decision on which types and sources of marine litter should be given priority in relevant action programmes.

Regular and continuous monitoring of marine litter will also be essential as a follow-up of any actions taken. Monitoring is essential for the provision of reliable information about the effectiveness of actions taken to reduce marine litter in marine and coastal environments.

Marine litter monitoring programmes are already operational in various parts of the world, and the survey protocols used are in some cases rather similar. However, in order to provide

consistent data and information about quantities and trends in marine litter, and thus build a common global basis for action, better co-ordination, coherence and compatibility between ongoing monitoring activities is required. One way of doing this could be through the development of a limited number of basic marine litter indicators to be used in all monitoring activities.

Organized beach surveys, as well as more "amateur" beach clean-up activities, are also important tools in educating and involving local communities, stakeholders and media, with the purpose to increase knowledge and awareness of the problems caused by marine litter. With that as a basis, political impetus can be created for actions to be taken to better control and manage marine litter.

3.4 Information, education, outreach and public awareness

Information, education and outreach activities have generally been viewed as essential and integral components of strategies to prevent, reduce and eliminate marine litter. The ultimate goals of the programmes are, generally, to bring about a change in attitudes and behaviours of the polluters (target groups).

In order to design effective information and educational programmes, there is also a strong need to better understand which sectors and groups that are responsible for contributing marine litter – and why it happens. Once that knowledge is available, targeted awareness-raising programmes can be developed and implemented.

Target groups could be, *inter alia*, ship officers and crews, as well as people working in shipping companies; local communities; various groups within the tourism sector; students at different levels; people working in the media; and the general public.

4. WAYS FORWARD

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The information gathered and analysis made within the framework of this feasibility study demonstrates that marine litter, while currently addressed in a variety of contexts by a number of knowledgeable and efficient entities, continues to pose a serious threat to the environment and sustainable development. Strengthening and expanding the efforts of these entities (as discussed above) as they act in their respective regional and global contexts could greatly enhance their efforts to diminish the marine litter problem. Moreover, greater coordination and cooperation among them could be the most powerful means of ensuring that the battle against marine litter is waged in a comprehensive and effective manner.

There are a number of potential modalities for strengthening cooperation among the relevant entities (including UN bodies, conventions and agreements, national governments, NGOs and others). *Ad hoc* and bilateral cooperative efforts can be effective, but a more streamlined approach, including a steering/coordinating committee, composed of UN agencies, Regional Seas Programmes and relevant representation of NGOs and private sector organizations, could also be used.

Such a committee could decide on priorities and coordinated activities, with all partners being responsible, jointly and individually, for the mobilization of funds and implementation of global, regional and sectoral activities. Activities could include (1) Information outreach and fund-raising; (2) Building ownership and partnerships; and (3) Global, regional and national activities, as well as activities to be undertaken within specific relevant sectors.

UNEP/GPA, IMO, FAO, the Basel Convention, IOC, Regional Seas Conventions and Action Plans and other concerned global and regional organizations as well as the numerous NGOs could all play an important role in such a coordinated attack on marine litter, given their varied and respective unique expertise and knowledge of different aspects of marine litter.

Regardless of the structure of any coordinated action taken, a large number of potential actions to strengthen marine litter efforts have been identified by the various expert organizations consulted in the compilation of this study including, *inter alia*:

- Development of guidelines for management of marine litter at the regional and national levels;
- Development of sectoral guidelines, *e.g.*, guidelines for tourism, boating, diving, cruise lines, coastal construction, fisheries. Guidelines for marine excursion providers (scuba, boating, recreational fisheries and wildlife watching);
- Development of 'responsible citizenship' guidelines for different target audiences, in particular children and tourists. Practical demonstration through awareness-raising campaigns in selected destinations and with selected tourism companies;
- Assessment of gaps and needs related to marine litter in selected regions and development of activities aimed at improving the situation. These could be used as pilot projects;
- Assessment of the general effectiveness of the Annex V to MARPOL 73/78 (IMO);
- Assessment of the effectiveness of the implementation of the MARPOL 73/78 Annex V Special Area provisions in the Mediterranean, the Wider Caribbean and the North Sea regions;
- Evaluation of those parts of the FAO Code of Conduct for Responsible Fisheries that deal with lost or discarded fishing gear;
- Evaluation of those parts of the FAO Code of Conduct for Responsible Fisheries that deal with management of wastes from fishing vessels that are included in the MARPOL 73/78 Annex V;
- Inclusion of marine litter in global and regional environmental assessments;
- Improvement of port reception facilities and better waste management;
- Monitoring of compliance with no-dumping regulations for plastics;
- Evaluation of a strategy for environmentally sound management of hazardous and other wastes, such as lead acid batteries and biomedical and healthcare wastes, for impacts on the marine environment;
- Increasing local planning and management capacity to avoid location of waste dump sites near coastlines or waterways or to prevent litter from escaping into the marine and coastal environment;
- Formulation and implementation of improved solid waste management programmes in small rural communities to prevent litter from escaping into rivers and the marine and coastal environment;
- Establishment of campaigns and /or permanent services for collecting solid wastes that pollute marine and coastal areas;
- Long-term and well-designed research and monitoring programmes and studies in order to detect and determine statistically significant trends in the composition, quantities and effects of marine litter globally and regionally; and
- Support to organized beach surveys and beach clean-up activities by NGOs

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ACRONYMS

AMRF	Algalita Marine Research Foundation
CBD	UN Convention on Biological Diversity
CEP	Caribbean Environment Programme
CMC	Centre for Marine Conservation
DTIE	UNEP's Division of Technology, Industry and Economics
EU	European Union
FAO	United Nations Food and Agriculture Organisation
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
HELMEPA	Hellenic Marine Environment Protection Association
IAEA	International Atomic Energy Agency
ICC	International Coastal Cleanup
ICCL	International Council of Cruise Lines
ICRI	The International Coral Reef Initiative
IMO	International Maritime Organisation
IOC	Intergovernmental Oceanographic Commission (IOC) of UNESCO
LC	London Convention
MARPOL	International Convention for the Prevention of Pollution from Ships
NGO	Non-governmental organization
NOAA	United States National Oceanic and Atmospheric Administration
NOWPAP	Northwest Pacific Action Plan
OSPAR	Commission for the Protection of the Marine Environment of the North-East Atlantic
PADI	Professional Association of Dive Instructors
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WHO	World Health Organization
WMO	World Meteorological Organisation
WSSD	World Summit on Sustainable Development
WWF	World Wide Fund for Nature

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